

Attorney Docket No. 004085.P030X

Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of: )  
Christopher Bajorek, et al. ) Examiner: M. Daniels.  
Application No.: 10/659,006 ) Art Group: 1732  
Filed: September 9, 2003 )  
For: Isothermal Imprinting )

Commissioner for Patents  
PO Box 1450  
Alexandria, Virginia 22313-1450

**SUPPLEMENTAL DECLARATION OF DAVID TREVES**  
**UNDER 37 C.F.R. § 1.132**

I, David Treves, hereby declare and say as follows:

I earned my B.Sc. degree in electrical engineering, Summa cum Laude, at the Technion, Israel Institute of Technology, in 1953. I earned an Ingenieur degree in electrical engineering at the Technion in 1954. I earned an M.Sc. degree in electrical engineering in 1956 at the Technion and a D.Sc. degree in electrical engineering in 1958 at the Technion.

For the last fifty years I have worked in a number of research departments in the fields of electrical engineering and physics. Attached as Exhibit A is my curriculum vitae, listing my publications and previous positions. Although listed in Exhibit A, I mention here that I have served on the technical staff at Bell Telephone Laboratories, I was a fellow at IBM, I was a professor of Electronics at the Weizmann Institute of Science, and I worked as a scientist at the Xerox Palo

Alto Research Center. I am currently an IEEE Life Fellow and a WD Fellow at WDC., the assignee of the present application.

I have published more than 125 technical papers and 23 U.S. patents have been issued to me.

I have extensive experience in the field of magnetic recording disks and, also, in the manufacture of magnetic recording disks using embossing techniques. As such, I believe I am familiar with the prior art relating to the present invention and am familiar with the knowledge of one of ordinary skill in the art relating to the invention. I also understand the present invention.

The Examiner rejected claims 1, 2, 8, 10-12, 17, 20 and 22 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent Publication No. 20020025408 of Davis ("Davis"). I understand that the Davis discloses:

Once the substrate has attained the desired temperature, it is placed in the mold and pressure is applied. After placing the substrate in the mold the temperature thereof can be maintained, increased or decreased as necessary in order to optimize replication and enable substrate release from the mold while maintaining the integrity of the surface features. Typically in order to maintain the integrity of the surface features, the molded substrate is cooled to below the glass transition temperature prior to removal from the mold. (Davis, paragraph 0075)

For nano-imprint lithography, the polymer to be imprinted is heated above the glass transition temperature in order to make it soft enough for imprinting without the need to apply exorbitant pressure that would ruin the molding stamper.

In the cases described in prior art, the mold was cooled below the glass transition temperature after imprinting and prior to opening the mold, in order to have the polymer solidified enough to avoid reflow and altering the imprinted features. In the early stages of our research, we found that this procedure worked

reasonably well for large features. However, for small features, below a few tenths of a micrometer, there invariably appeared a severe distortion of the features. The distortion seemed to be a shearing in the radial direction.

We unexpectedly found that if we selected the embossing temperature slightly above the glass transition temperature of the polymer, the shearing distortion disappeared if we did not cool the mold before opening it. For example, for a polymer with a glass transition temperature of 115 degrees C, (Micro Resist Technology mr-18030E), embossing and opening the mold at 128 degrees C resulted in excellent reproduction as shown in the attached figure; the left side of the figure is a scanning electron micrograph of the stamper used. The right side of the figure is an AFM of the imprint on the polymer. The width of the features here is about 0.055 micrometer. The polymer was coated on a magnetic recording disk using an Aluminum substrate and the stamper was made of Nickel. The molding time to obtain good replication was as short as 5 seconds. The range of embossing temperature at which the mold was opened that gave good results was between 126 and 130 degrees C, well above the glass transition temperature of 115 degrees C. Higher temperature caused reflow on opening the mold, while lower temperature resulted in poor replication.

It was a total surprise that there existed any temperature above the glass transition temperature at which good embossing and separation occurred without incurring reflow upon opening the mold before cooling to below the glass transition temperature.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or

imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated: Oct 29, 2008

David Treves

David Treves

WD Fellow

WDC